defined, the others nodulated and less distinct. The valves are covered, between the ridges, with rounded tubercles. In young specimens the longitudinal ridges are sharper, the surface-tubercles are sharp and spinous, and the elevated anterior border is absent or indistinct. The young state of this species is represented in figs. 12–15. Length (of the adult) $\frac{1}{3\,3}$rd of an inch.

The above description applies to well-marked specimens; and much latitude must be allowed as to the amount of spinous and tubercular development, especially with reference to the squamous spines and lamina of the posterior extremity.

EXPLANATION OF PLATE IX.

Fig. 1. *Cythere carinata* (Brady), left valve, × 50.
Fig. 2. The same, seen from above, × 50.
Fig. 3. The same, seen from below, × 50.
Fig. 4. The same, end view, × 50.
Fig. 5. *Cythere arborescens* (Brady), perfect carapace, × 40.
Fig. 6. The same, seen from above, × 40.
Fig. 7. The same, seen from below, × 40.
Fig. 8. The same, end view, × 40.
Fig. 9. *Cytheridea punctillata* (Brady), left valve. × 40.
Fig. 10. The same, seen from above, × 40.
Fig. 11. The same, end view, × 40.
Fig. 12. *Cythere aspera* (Brady), right valve (young), × 40.
Fig. 13. The same, seen from above, × 40.
Fig. 14. The same, seen from below, × 40.
Fig. 15. The same, end view, × 40.
Fig. 16. The same, adult right valve, × 40.
Fig. 17. The same, seen from above, × 40.
Fig. 18. The same, seen from below, × 40.
Fig. 19. The same, end view, × 40.

XXVI. *Classification of Polyps.* (*Extract condensed from a Synopsis of the Polypi of the North Pacific Exploring Expedition under Captains* Ringgold *and* Rodgers, *U.S.N.*) By A. E. Verrill*.

The report upon the collection made by Dr. William Stimpson, naturalist to the expedition, having been much delayed, the following tabular view of the classification adopted is here presented, with the hope that, if imperfect like every other, it may nevertheless afford some aid in illustrating the natural affinities of these humble forms.

Although, in a communication read before a zoological club at Cambridge, January 1862, I attempted to demonstrate the

* From the 'Proceedings of the Essex Institute,' U. S., for 1865.

existence of the three natural orders among Polyps, I refrained from presenting this view in a paper published last year, in order that I might make further investigations upon the subject before finally publishing it.

Class *CNIDARIA* or *POLYPI.*

Order I. MADREPORARIA.

Polyps simple or compound, with embryonic or rudimentary basal or abactinal region, which has no special function, unless for vegetative attachment while young. Actinal area well developed, form broadly expanded, having a tendency in the higher groups to become narrowed towards the mouth. Tentacles simple, conical. Dermal tissues and, usually, the radiating lamellæ depositing solid coral; the radiating plates, being between the lamellæ, are therefore ambulacral, and appear to originate from the surfaces of the lamellæ and the connective tissues extending across the ambulacral chambers and filling them from below. Interambulacral spaces distinct.

Suborder I. Stauracea (*Madreporaria rugosa*)*.

Coral simple, or compound by budding; chiefly *epidermal* and *endothecal*; *septa* apparently in multiples of four, sometimes wanting. Type embryonic, like a young *Astrea* or *Fungia.*

Families: Stauridæ, Cyathophyllidæ, Cyathaxonidæ, Cystiphyllidæ.

Suborder II. Fungacea.

Polyps either simple or compound by marginal or disk-budding, rarely by fissiparity. Tentacles numerous, in multiples of six, imperfectly developed, scattered on the actinal surface, usually short and lobe-like. Upper part of polyps scarcely exsert. Coral broad and low, growth mostly centrifugal, tissue

* This group is placed here with considerable hesitation, and principally on account of the close resemblance in structure to the young of the succeeding and higher groups when they first begin to form a coral, which then consists of a ring of epitheca or epidermal deposit, with a few, imperfect, rugose septa radiating from the centre. If the number four be a constant feature of the arrangement of their septa, it is possible that they may be entitled to rank as a separate order of Polyps. To this opinion Prof. J. D. Dana inclines. Prof. Agassiz unites the group with Hydroid Acalephs, on account of their resemblance in some features to the Tabulata. It seems to me, however, that the absence of transverse plates in Cyathaxonidæ and Cystiphyllidæ, and the perfection of the vertical septa in Stauridæ, Cyathaxonidæ, and some of the Cyathophyllidæ, together with their general structure, show them to be more closely allied to the Fungacea and Astreacea, of which they may be considered embryonic types, while at the same time the group is a synthetic one, having analogies with nearly all the higher groups of Polyps and also, in some respects, with Hydroids.

chiefly septal; walls imperfectly developed, often perforate, subordinate, usually forming the basal attachment.

Families: Cyclolitidæ, Lophoseridæ, Fungidæ, Merulinidæ.

Suborder III. Astreacea.

Polyps mostly compound, either by fissiparity or various modes of budding. Tentacles usually well developed, long, subcylindrical, limited in number, in multiples of six, encircling the disk. Coral mural, septal, and endothecal; growth vertical and centrifugal, producing turbinated forms which are often elongated.

Families: Lithophyllidæ, Mæandrinidæ, Eusmiliidæ, Caryophyllidæ, Stylinidæ, Astreinæ, Oculinidæ, Stylophoridæ.

Suborder IV. Madreporacea (*Madreporaria perforata*).

Tentacles in definite numbers, twelve or more, well developed, encircling the narrowed disk, therefore nearer the mouth; polyps with the upper portion much exsert, flexile; growth chiefly vertical; coral mural and septal, porous. Polyps compound by budding, sometimes simple.

Families: Eupsammidæ, Gemmiporidæ, Poritidæ, Madreporidæ.

Order II. ACTINARIA.

Polyps with well developed, often highly specialized, basal or abactinal region. Walls well developed; tentacles longer, more concentrated around the mouth, which is also usually, if not always, furnished with special tentacular lobes or folds. Ambulacral spaces always open, destitute of connecting tissues and solid deposits.

Suborder I. Zoanthacea.

Polyps encrusting, adherent, budding from mural expansions; tentacles simple, short, at edge of disk.

Families: Zoanthidæ, Bergidæ.

Suborder II. Antipathacea.

Polyps connected by a cœnenchyma, secreting a solid sclerobase or coral-axis. Tentacles few, six to twenty-four, simple, conical.

Families: Antipathidæ, Gerardidæ.

Suborder III. Actinacea.

Polyps free, capable of locomotion, with a highly specialized muscular base or abactinal area. Tentacles well organized, either simple or branched, varying from ten to many hundreds, often with accessory organs arising from the same spheromeres,

such as inner tentacles, verrucæ, complicated or simple branchial lobes, cinclidæ, eye-spherules, suckers, &c. Mouth with special lobes or folds. Most of the species are simple, a few are compound by fissiparity, many abnormally bud from the wall near the base, a few secrete from the base a horn-like deposit similar to the axis of *Antipathes*.

Families: Actinidæ, Thalassianthidæ, Minyidæ, Ilyanthidæ, Cerianthidæ.

Order III. ALCYONARIA.

Polyps with well developed actinal, mural, and abactinal regions, compound by budding. Tentacles eight, pinnately lobed, long, encircling a narrow disk. No interambulacral spaces. Ambulacral ones open and wide.

Suborder I. Alcyonacea.

Polyps turbinate at base, budding in various ways, encrusting, adherent to foreign bodies by the cœnenchyma.

Families: Alcyonidæ, Xenidæ, Cornularidæ, Tubiporidæ.

Suborder II. Gorgonacea.

Polyps cylindrical, short, connected by a cœnenchyma, secreting a central supporting axis.

Families: Gorgonidæ, Plexauridæ, Primnoidæ, Gorgonellidæ, Isidæ, Corallidæ, Briaridæ.

Suborder III. Pennatulacea.

Polyps forming free moving colonies, the composite basal portion with locomotive functions and special cavities, with or without a solid free axis.

Families: *Pennatulidæ, Pavonaridæ, Veretillidæ, Renillidæ.*

Among the most interesting species in this collection the following may be mentioned:—

Stephanoseris lamellosa, Verrill.

Coral low, subcylindrical, with a broad base, which completely covers small univalve shells, with the exception of the opening; wall rudimentary; septa in four cycles, the primaries much the largest, with subentire rounded tops; columella well developed, papillose; costæ prominent, unequal.

Loo-Choo Islands. Dr. Wm. Stimpson.

Heterocyathus alternata, Verrill.

A low species with very unequal septa and costæ, the primary

septa very prominent. Encrusts and covers small univalve shells.

Gaspar Straits. Capt. John Rodgers.

Balanophylia capensis, Verrill.

A species about half an inch high, broadly attached, slightly turbinated, with an epitheca rising within a line of the margin. Calicle deep, broadly oval. Septa in four cycles, the principal ones much exsert, vertical, narrowed at top, those of the fourth cycle joining the columella in pairs. Colour of the living Polyp bright orange.

Cape of Good Hope. Dr. Wm. Stimpson.

Eupsammia Stimpsonii, Verrill.

Coral free, elongated, turbinated, blunt at base. Calicle oval, deep; columella well developed; septa broad, the principal ones with entire inner edges, rounded. Length an inch or more; breadth of cell ·3 in.

Interesting as a living representative of a genus hitherto known only in the fossil state.

North China Sea. Dr. Wm. Stimpson.

Metridium fimbriatum, Verrill.

A species closely allied to *M. marginatum* of this coast, but apparently more elongated, with longer and more slender tentacles, which are almost hair-like. Disk within the tentacles narrow. "Colour pale orange, translucent; body punctate with dark brown; mouth deep orange."

San Francisco, California. Dr. Wm. Stimpson.

Phellia collaris, Verrill.

Edwardsia collaris, Stimpson, Proc. Philad. Acad. Nat. Science, May and June 1855.

A species remarkable for its great size compared with previously known species from Europe.

Hong-Kong, China. Dr. Wm. Stimpson.

Phellia clavata, Verrill.

Edwardsia clavata, Stimpson, *l. c.* 1855.

A species even larger than the last.

Near Ousima, Japan. Dr. Wm. Stimpson.

Ammonactis, nov. gen.

Column elongated, subcylindrical, with well developed basal disk, covered, as in *Phellia*, with a persistent epidermis extend-

ing to near the summit, naked above; but differs in having a lobe-like tubercle below each tentacle, distinct from the margin. Tentacles long and numerous.

Ammonactis rubricollum, Verrill.

Edwardsia rubricollum, Stimpson, *l. c.* 1855.

Hong-Kong, China. Dr. Wm. Stimpson.

Halocampa brevicornis, Verrill.

Edwardsia brevicornis, Stimpson, *l. c.* 1855.

Hong-Kong, China. Dr. Wm. Stimpson.

Halocampa capensis, Verrill.

Body elongated; tentacles twenty, blunt; ambulacra subpapillose. Six tentacles have their inner bases dark brown; body pale reddish, with dots and patches of flake white; inner side of tentacles flake white.

Cape of Good Hope, 12 fathoms, sand. Dr. Wm. Stimpson.

Cerianthus orientalis, Verrill.

A large species, similar to *C. americana*, nobis. Body elongated, in a tube of mud. Tentacles long and slender. Colour of body deep reddish brown; outer tentacles translucent, yellowish and white, pale brown on their inner sides, greenish at base; inner ones purplish brown, or sometimes grass-green.

At low-water mark, Hong-Kong, China. Dr. Wm. Stimpson.

Nephthya thyrsoidea, Verrill.

Polyps forming thyrsiform bunches of closely clustered branchlets, 3 inches high and 2 inches broad. Colour wine-yellow or light brown, with a dark purplish tinge below the tentacles; tentacles nearly white; spicula forming elevated transverse lines of silvery white on the stalks.

Cape of Good Hope, 20 fathoms, rocks. Dr. Wm. Stimpson.

Telesto ramiculosa, Verrill.

Cornularia aurantiaca, Stimpson, *l. c.* 1855, non *T. aurantiaca*, Lamx.

Hong-Hong, 10 fathoms, shelly bottom. Dr. Wm. Stimpson.

Parisis laxa, Verrill.

Coral forming openly reticulate fronds; papillæ numerous, rounded, on all sides of the branches; cœnenchyma minutely villous in alcohol. Calcareous joints shorter, and internodes longer, than in *P. fruticosa*, nobis.

Hong-Kong. Dr. Wm. Stimpson.

Acanthogorgia coccinea, Verrill.

Nepthya coccinea, Stimpson, *l. c.* 1855.

Hong-Kong, 10 fathoms, on shells. Dr. Wm. Stimpson.

Veretillum Stimpsonii, Verrill.

A large species, 6 or 8 inches long, the upper portion enlarged, more than half the entire length. Polyps much exsert, upwards of an inch long; tentacles very long. Axis thick, short, fusiform, a third of an inch long. Base white, somewhat striated; body light cream-colour; polyps transparent, bluish white at the bases of the tentacles.

Hong-Kong, 6–10 fathoms, mud. Dr. Wm. Stimpson.

Veretillum baculatum, Verrill.

Club-shaped, the base about a third of the length. Polyps scattered, not numerous. Axis small, fusiform, about half an inch long in a specimen 3 inches long.

Sea of Ochotsk, off Siberia. L. M. Squires.

Kophobelemnon clavatum, Verrill.

Veretillum clavatum, Stimpson, *l. c.* 1855.

Polyps more numerous and crowded than in *K. Burgeri*, Herkl., which it resembles; body more claviform, naked dorsal space very narrow.

Hong-Kong, 6 fathoms, mud. Dr. Wm. Stimpson.

PROCEEDINGS OF LEARNED SOCIETIES.

ROYAL SOCIETY.

June 15, 1865.—Major-General Sabine, President, in the Chair.

"On the Anatomy and Physiology of the Nematoids, parasitic and free; with observations on their Zoological Position and Affinities to the Echinoderms." By Henry Charlton Bastian, M.A., M.B. (Lond.), F.L.S.

After commenting upon the many conflicting statements which have been made concerning the anatomy of these animals, and more especially with regard to the presence or absence of a nervous system, and of real organs of circulation, the author alludes to the increased interest which has lately been thrown over this order by the discovery of so many new species of the non-parasitic forms, marine, land, and freshwater.

He has entered fully into the description of the tegumentary organs, and has recognized a distinct cellulo-granular layer intervening between the great longitudinal muscles and the external chiti-